No. 6.—*Revision of the African Terrapin of the Family Pelomedusidae*

By Arthur Loveridge

It has long been obvious to taxonomists that, owing to inadequate material, the key furnished by Boulenger (1889a, p. 192) for distinguishing members of the genus *Pelusios* proved so misleading as to result in the greatest confusion for half a century, as is shown by the voluminous literature. Indeed, the only attempt to straighten out the situation was that of Siebenrock (1903d), who failed, on account of the alternative characters which he selected proving no less variable than those of Boulenger which he rejected.

Recent nomenclatorial changes necessitated my investigating the status of certain names in order to ascertain which were applicable to three species of the family collected on my last visit to East Africa. I found the whole situation so involved that eventually I decided on the present revision, which is humbly offered in the hope that its conclusions will form a stable basis that will stand the test of time.

The most important change is the rejection of *niger* from the West African fauna, except as a synonym of *subniger* Lacépéde, for the '*niger*' of Boulenger and subsequent authors is a synonym of *gabonensis* Duméril, and nothing to do with the *niger* of Duméril & Bibron who believed, and probably correctly, that their 180 mm. type came from Madagascar. I am deeply indebted to Mons. Angel for detailed notes on the type of *niger*, without which I could not have settled the point.

I take this opportunity of thanking Mons. Angel (Paris), Dr. Oscar de Beaux (Genoa), Dr. L. D. Brongersma (Leiden), Dr. P. R. Reveilliod (Geneva), Dr. L. Forcart (Basel), Mr. G. Netting (Pittsburgh), and Mr. H. W. Parker (British Museum) for the loan of material or for answering my queries respecting material in their care. And by no means least, Mr. Vesey FitzGerald of the Malay States, who took the trouble to secure a series of *seychellensis*, which he has presented to the Museum of Comparative Zoölogy.

No attempt has been made to complete bibliographical references prior to 1889. From that date I have attempted to list all those found in a search through 1,500 papers on African herpetology. I hope that omissions will not prove numerous. A synopsis of the information culled from this literature, is given for each species, though in the fields of anatomy and physiology only the barest reference is made.

Taxonomic changes. Many earlier synonymizings are confirmed, while the following alterations in nomenclature are made for the first time.

Pelomedusa galeata orangensis Hewitt
= *Pelomedusa s. subrufa* (Lacépède).
Pelomedusa galeata devilliersi Hewitt
= *Pelomedusa s. subrufa* (Lacépède).
Pelomedusa galeata damarensis Hewitt
= *Pelomedusa s. subrufa* (Lacépède).
Pelomedusa subrufa wettsteini Mertens
= *Pelomedusa s. subrufa* (Lacépède).
Emys olivacea Schweigger is revived as
Pelomedusa s. olivacea (Schweigger).
Pelomedusa gasconi Rochebrune
= *Pelomedusa s. olivacea* (Schweigger).
P. g. var. *disjuncta* Vaill. & Grand.
= *Pelomedusa s. olivacea* (Schweigger).
Sternothaerus niger Blgr. (*non* D. & B.)
= *Pelusios gabonensis* (A. Duméril).
Sternothaerus derbianus Gray = *Pelusios subniger* (Lacépède).
Sternothaerus oxyrhinus Boulenger = *Pelusios subniger* (Lacépède).
S. nigricans seychellensis Siebenrock = *Pelusios subniger* (Lacépède).

Origins. It would appear to me that the Pelomedusidae entered Africa from the north or northwest with *Pelomedusa s. olivacea* (Senegal to Eritrea), if recognisable, as the oldest living form, giving off *P. s. subrufa* (Sudan to Cape) which in turn produced *Pelusios adansonii* (Senegal to the Nile). The latter would appear to have given rise to the handsomest member of the genus *P. gabonensis* (Liberia to Congo) an inhabitant of the West African rainforest region. The widespread *P. subniger* may also be assumed to have risen from *adansonii* or some common ancestor, and in the east developed the handsome *sinuatus* (Somaliland to Natal).

Designation of Headshields. The shields called frontals by Boulenger, prefrontals by some other authors, I designate supraorbitals. The huge shield which he called a parietal, appears to have been formed by fusion of the frontal with the parietals, as may be deduced from the frequency with which grooves appear on its posterior half, indicative of the lines of fusion. This shield I call the frontal, it is flanked on either side by a large temporal which is subject to subdivision.

Description. At the risk of monotonous repetition, I have drafted somewhat detailed descriptions based on the material at my disposal, augmented in footnotes by further variations observed by other workers. This has been done because some recent authors have been

apt to attach undue importance to extremely variable characters, often those which have long been known to be sexual or subject to alteration with age. The descriptions now drawn up show that most of the species run the whole gamut of such variations.

Localities. Rochebrune's (1884a) localities have been omitted as untrustworthy. Otherwise I have attempted to list, after each species, all the localities from the literature for the past fifty years, except such as have been subsequently shown to be based on erroneous identifications, now transferred to their appropriate species. I should have liked to cite the author responsible for each locality, this, however, would have added enormously to the burden of printing.

Political areas have been arranged on a definite geographical plan, the place names alphabetically within their respective political areas.

Family PELOMEDUSIDAE

Freshwater Terrapin

Semiaquatic tortoises covered with horny shields overlying the bony plates of a more or less depressed box-like exoskeleton; head and neck completely retractile within the shell by lateral flection; nostrils at end of snout; jaws covered with a horny beak; dentary single; palatine bones in contact; no nasals; prefrontals in contact; temporal region not roofed over; a bony temporal arch; no parietosquamosal arch; digits moderately elongate; hind foot webbed; five or four[1] claws.

For detailed structural definition of the Pleurodira, in which superfamily the Pelomedusidae are included, see Boulenger, 1889a, Catalogue of Chelonians . . . in the British Museum, pp. 187–190.

Range. Africa, Seychelles, Madagascar and South America.

Key to the Genera

Anterior lobe of plastron immovable; pectoral shields participating equally with abdominals on bridge; plastral fenestration persisting till late in life; mesoplastra small and lateral . . . . . *Pelomedusa* (p. 470)

Anterior lobe of plastron movable in adult; pectoral shields almost excluded from bridge by abdominals; plastral fenestration closed very early in life; mesoplastra extending right across the plastra . . . . . *Pelusios* (p. 481)

[1]Four on hind foot of Malagasy *Erymnochelys* and S. American *Podocnemis*.

Genus Pelomedusa

1830. *Pelomedusa* Wagler, Nat. Syst. Amphib., p. 136 (type *galeata* = *subrufa*).
1831. *Hydraspis* Gray (part), Syn. Rept., p. 39 (type *Hydraspis longicollis*).
1835. *Pentonyx* Duméril & Bibron, Erpét. Gén., **2**, p. 389 (type *capensis* = *subrufa*).

Skull without supratemporal roof; quadrato-jugal widely separated from parietal; upper jaw with very indistinct median ridge on alveolar surface; between the orbits are a pair of supraorbital shields separated by a longitudinal suture and followed by a large frontal flanked by temporals; plastron narrow, without hinge; mesoplastral bones small, lateral, wedged in between the hyoplastra and hypoplastra; plastral fenestration persisting till late in life; digits very short, mostly with 2 phalanges, feet with 5 claws.

Range. Africa south of the palaearctic zone; Madagascar.

Remarks. A single species (*Pelomedusa subrufa*) with a poorly defined race occurring along the northern fringe of its range. Scattered individuals possessing the character of the northern form crop up within the range of typical *subrufa*, but should not be considered to invalidate the recognition of the northern form unless they prove to be far more numerous than our present information would indicate.

Key to the Races

Pectoral shields in contact on the median line of the plastron . . . . . *s. subrufa* (p. 470)
Pectoral shields separated on the median line of the plastron . . . . . *s. olivacea* (p. 480)

Pelomedusa subrufa subrufa (Lacépède).

1788. *La Roussatre* Lacépède, Hist. nat. Quadrup. ovip. Serpens, **1**, p. 173, pl. xii: "de l'Inde" as Sonnerat coll. restr. to Cape.
1789. *Testudo subrufa* Lacépède, Hist. nat. Quadrup. ovip. Serpens, **2**, Synopsis methodica (a table in which binomials are employed.)
1789. Bonnaterre, p. 27.
1802. Daudin, p. 132.
1792. *Testudo galeata* Schoepff, Hist. Testud., p. **12**, pl. iii, fig. 1: "India orientali, Carolina" restr. to Cape Flats, S. Africa.
1802. Daudin, p. 136.
1798. *Testudo Badia* Donndorff, Zool. Beytr. Linn. Natur., **3**, p. 34: No locality. Based on Lacépède's "*La Roussatre.*"
1814. *Emys galeata* Schweigger, p. 38.
1814. *Emys subrufa* Schweigger, p. 39.

1830. *Pelomedusa galeata* Wagler, p. 136, pl. ii, figs. 36–43.
1848. Peters, p. 492, pl. xvii, figs. 1–3.
1849. Smith, App., p. 1.
1862. Strauch, p. 150.
1865. Strauch, p. 111.
1869b. Peters, p. 657.
1870. *Steindachner, p. 326.
1880a. Boulenger, p. 146.
1880b. Peters, p. 509.
1881b. *Boettger, p. 410.
1881c. Boettger, p. 535.
1882a. Peters, p. 6.
1884a. *Rochebrune, p. 22.
1887a. Bocage, p. 202.
1887b. Boettger, p. 140.
1888a. Boettger, p. 13.
1889. Boettger, p. 296.
1889a. *Boulenger, p. 197.
1890a. *Müller, p. 296.
1890. Strauch, p. 103.
1893a. Boettger, p. 14.
1893b. Boettger, pp. 113, 122.
1894a. Boettger, p. 88.
1894. Fleck, p. 83.
1894. Günther, p. 85.
1895a. Bocage, p. 5.
1895b. *Boulenger, p. 531.
1895. Jeude, p. 227.
1896a. Bocage, p. 97.
1896a. *Boulenger, p. 546.
1896b. Boulenger, p. 6.
1896c. *Boulenger, p. 16.
1896e. Boulenger, p. 213.
1897g. Boulenger, p. 277.
1897. Siebenrock, p. 247.
1898. Jeude, p. 9.
1898a. Vaillant, p. 135.
1898. Sclater, p. 97.
1898. Tornier, p. 282.
1899. Siebenrock, p. 566.
1900a. Mocquard, p. 94.
1900b. Tornier (part), p. 583.
1901. Gadow, p. 391.

* These should be transferred in whole or in part to *olivacea* should that race prove to be recognisable.

1901c. Tornier, p. 67.
1902d. Boulenger, p. 445.
1902a. Mocquard, p. 6.
1902b. Tornier, p. 580.
1902c. Tornier, p. 665.
1903e. Boulenger, p. 217.
1903a. Siebenrock, p. 255.
1904. Peracca, p. 1.
1905. Neumann, p. 390.
1905c. *Tornier, p. 366.
1906a. Mocquard, p. 480.
1906b. Siebenrock, p. 40.
1907j. Boulenger, p. 483.
1907. Lönnberg, p. 2.
1908. Werner (1907), p. 1826.
1909. Siebenrock, p. 561.
1910. Meek, p. 414.
1910b. Nieden, p. 7. (text apparently transposed with that of *gabonensis*)
1910. Siebenrock, p. 718.
1910. Vaillant & Grandidier, pp. 26, 53, pl. xx, figs. 1–2, pl. xxi, fig. 1.
1910a. Werner, p. 305.
1911c. Boulenger, p. 162.
1911. Lampe, p. 148.
1911b. Sternfeld, p. 411.
1911d. Sternfeld, p. 53, figs. 65–66.
1912c. Sternfeld (part), p. 201.
1912b. Werner, p. 469.
1913. Boettger, p. 319.
1913c. Nieden, p. 64.
1915. Rawitz, p. 670.
1917. Sternfeld, p. 414.
1919. Schmidt, pp. 415, 598, 601, fig. 1.
1921d. Loveridge, p. 52.
1922a. Angel, p. 39.
1922. Kaudern, p. 449.
1923b. Calabresi, p. 156.
1923g. Loveridge, pp. 930, 932.
1924b. Loveridge, p. 2.
1924a. Werner, p. 266.
1925b. Flower, p. 933.
1926a. Mertens, p. 152.
1927. Calabresi, pp. 20, 38.
1928. Cott, p. 952.

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1928d. Loveridge, p. 51.
1928b. *Scortecci, p. 336.
1928m. Witte, p. 45.
1929. Lindholm, p. 288.
1929h. Loveridge, p. 16.
1929. Rose, p. 185, fig. 123.
1930a. *Scortecci, p. 215.
1931d. Angel, p. 551.
1931. Mann, p. 366.
1931. Monard, p. 110.
1931. Power, p. 48.
1932b. Parker, p. 340.
1933. Flower, p. 752.
1933h. Loveridge, p. 211.
1933. Schmidt, p. 3.
1933m. Witte, p. 67.
1934. Pitman, p. 307.
1935b. FitzSimons, p. 307.
1935. Hewitt, p. 325.
1936. Cowles, p. 6.
1936h. Loveridge, p. 19.
1936j. Loveridge, p. 225.
1937. Buxton, p. 102.
1937f. Loveridge, pp. 489, 492, 495.
1937b. Monard, p. 146.
1938. FitzSimons, p. 155.
1939b. FitzSimons, p. 20.
1940a. Scortecci, p. 6.
1831. *Hydraspis subrufa* Gray, p. 39.
1835. [1]*Pentonyx Capensis* Duméril & Bibron, Erpét. Gén., **2**, p. 390, pl. xix, figs. 2–2b: Cape of Good Hope, etc. restr. by Mertens.
1860. A. Duméril, p. 163, pl. xiii, fig. 3.
1844. *Pelomedusa subrufa* Gray, p. 38.
1855. Gray, p. 53.
1867a. Steindachner, p. 6.
1870. Gray, p. 81.
1872a. Gray, p. 24.
1873b. Gray, p. 71.
1888a. Günther, p. 50.
1934a. Mertens, p. 10.
1937e. Hewitt, p. 14, pl. iv, figs. 1–3; pl. ivA, fig. 1; pl. xxvii, fig. 3.
1849. *Pentonyx americana* Cornalia, Vert. syn. Mus. Mediolan., p. 13: "New York" probably a South African specimen.

*These should be transferred in whole or in part to *olivacea* should that race prove to be recognisable.
[1] This specimen also served as the type of *Testudo subrufa* Lacépède.

1855. *Pelomedusa Mozambica* "Peters M.S.S. 1848" Gray, Cat. Shield Rept., p. 53: Mozambique (*nomen nudum*).
1856. *Pelomedusa mossambicensis* "Peters" Lichtenstein & V. Martens, Nomenclator Rept., p. 2: Mozambique (*nomen nudum*).
1863a. *Pelomedusa nigra* Gray, Ann. Mag. Nat. Hist. (3), **12**, p. 99: Natal.
1870. Gray, p. 81.
1873b. Gray, p. 72.
1872. *Hydraspis galeata* Gray, in Sowerby & Lear, p. **7**, pls. xlix–l.
1935. *Pelomedusa galeata subrufa* Hewitt, p. 326.
1935. *Pelomedusa galeata orangensis* Hewitt, Rec. Albany Mus., p. 332, pl. xxxi, fig. 3, pl. xxxii, figs. 3–4: ? Kimberly, Cape Province.
1935. *Pelomedusa galeata nigra* Hewitt, p. 335, pl. xxxii, figs. 1–2.
1935. *Pelomedusa galeata devilliersi* Hewitt, Rec. Albany Mus., p. 337, pl. xxxi, figs. 2, 4: Besondermeid, Steinkop, Namaqualand.
1935. *Pelomedusa galeata damarensis* Hewitt, Rec. Albany Mus., p. 338, pl. xxxiii, figs. 1–4: Quickborn, nr. Okahandja, S. W. Africa.
1935. *Pelomedusa galeata galeata* Hewitt, p. 342, pl. xxxiv, figs. 3–4.
1937a. *Pelomedusa subrufa wettsteini* Mertens, Zool. Anz., **117**, p. 141, figs. 1, 4: Majunga, West Madagascar.
1937b. *Pelomedusa subrufa damarensis* Mertens, p. 5.
1937d. *Pelomedusa subrufa subrufa* Mertens, p. 3.
1937e. *Pelomedusa subrufa orangensis* Hewitt, p. 14.

Names. Marsh Terrapin, Helmeted Terrapin (English); *njaba* (Ganda); *nguru* (Kitosh); *malwala* (Gogo); *camba na madsi* (at Rios de Sena); *nambe* (at Querimba); *fudue* (at Quilimane); *isifudu* (in Umzumbe Valley); *ufodo* (Fingo, but not specific); *ofiufiu* (at Kalukembe); *kitio* (at Quisange).

History. Mertens (1937, p. 139) has shown that the name *galeata*, so long employed for the marsh terrapin, is antedated by *subrufa* of Lacépède, not of Daudin.

Description. Head broad, snout short; a pair of supraorbital shields[1] followed by a very large frontal, flanked by a pair of temporals; narrowest interorbital width much shorter than the longitudinal suture between the supraorbitals; upper jaw angularly rounded; chin with, rarely without[2], a pair of small barbels; carapace depressed, its height included in its length from 2.50 to 3.50 times, slightly elongate, its posterior margin rounded or very slightly serrate; vertebral shields 5, more or less obtusely keeled, first vertebral largest, broader than long, fourth also broader than long; costals 4, very rarely 5[3]; marginals 22,

[1] Transversely divided in a Gomodimo terrapin (FitzSimons, 1935b, p. 307).
[2] Absent in specimens from Nkate (FitzSimons, 1935b, p. 307).
[3] 4 on left and 5 on right in Oda example (Tornier, 1905c, p. 366).

very rarely 24; supracaudals 2; plastron very much smaller than the opening of the carapace; anterior lobe truncate, broader than posterior which is more or less angularly and deeply notched; intergular much longer than a gular, its sides straight[1]; humerals 2, very rarely 4[2]; pectorals forming a median suture of variable length; pectoral and abdominal shields nearly equally developed on the bridge; width of bridge contained about 2½ times in the width of the plastron.

Anatomy. The skull has been described by Siebenrock (1897, p. 247), and later (1899, p. 566) the glottis; the musk gland by Peters (1848, p. 492), the alimentary canal by Vaillant & Grandidier (1910, p. 55), and the nervous system by Rawitz (1915, p. 670).

Coloration. Above, head and limbs dark olivaceous with, or without darker and lighter vermiculations; carapace light olive, yellow brown, or dark brown, uniform or with the margins of the shields edged with black; in young, which are olive green, the marginals are edged with creamy yellow alternating with black. Below, chin and throat white to yellowish white; plastron yellowish or horn colour with brown or black infuscations about the edge and along the sutures of the shields, or plastron entirely black.

In East Africa the only specimens seen which had entirely black plastrons came from the Mabira Forest and near Mount Elgon; perhaps, therefore, such colouring occurs in forested, or recently deforested, areas, while yellow plastrons are associated with more arid regions?

South African specimens whose plastrons have a maroon or dark red tinge, may supposedly be the result of staining from laterite soil, as is stated to be the case with Natal and Malagasy *subniger*.

Peters (1882a, p. 6) remarks that the iris has a silver gleam and is grey towards the periphery. Mann (1931, p. 366) shows that both the narrow circumpupillary zone as well as the narrow peripheral zone are covered with silver pigment while the vessels of the iris have much chocolate pigment in their walls obscuring the blood colour. Hewitt (1937e, p. 11) remarks that the pupil is circular and the iris has a yellow margin. Possibly based upon preserved material?

Measurements. Length of carapace of a ♂ from Tanganyika Territory, 200 mm., breadth 135 mm., height 68 mm.; length of carapace of a ♀ from Dodoma 161 mm.[3], breadth 128 mm., height 63 mm. Both surpassed by South African measurements furnished by Hewitt

[1] Pyriform in some South African specimens (Hewitt, 1935, p. 326).

[2] In an aberrant individual from Ngare na Nyuki (Lönnberg, 1907, p. 2).

[3] The ♀ of 179 mm. recorded by me (1933h, p. 212) proves to be a ♂.

(1935, p. 331) of a ♂ from Kingwilliamstown district (presumed) measuring 325 mm., breadth 245 mm., and a ♀ from Albany district (presumed) measuring 241.5 mm., breadth 180 mm. A ♂ from Khor Arbat with a carapace length of 200 mm. weighed 1.25 kilos (2.75 lbs.) according to Flower (1933, p. 753).

Sexual dimorphism. Males, recognisable by their longer tails, have narrower shells than females, while their claws are said by Werner (1910a, p. 305) to be stronger, not longer. Usually also they exhibit a slight depression in the posterior third of the plastron, the notch of its posterior lobe is not a guide. Hewitt (1935, p. 327) cites other differences which are individual rather than sexual, *cf.* contradictions regarding mesial notch and pear-shaped intergular.

Breeding. The only accounts of ovipositing are those published by Hewitt (1937e, p. 13), the most detailed being condensed as follows. One warm November evening, near Grahamstown, Miss. N. White surprised a female laying in a hole which had a surface diameter of 2½ inches, and a depth of from 4 to 5 inches terminating in a chamber slightly larger than a tennis ball. The surrounding ground was sun-baked, hard and dry, but the site had been softened by the terrapin discharging cloacal water, two other spots where an attempt to dig had been abandoned, were found within a couple of yards.

There were already 5 eggs in the hole and the terrapin continued depositing others at the rate of about one per minute until a total of 14 had been laid. Each egg had a dent in its tough membranous surface, and was covered with slime which took about an hour to dry. A noteworthy feature was the absence of any musky odour during ovipositing, though when the site was revisited next morning a foul smell was immediately apparent. The hole had been filled in with the excavated muddy soil and flattened, so that once sunbaked it would have escaped detection. An egg measured 37 x 25 mm.

Schmidt (1933, p. 3) records a hatchling, from Angola, which had already lost its egg tooth, as measuring 25 mm. in length and 19.5 mm. in breadth; the smallest East African (Guaso Nyiro) terrapin which I have seen had a carapace length of 34 mm., breadth 27 mm. and height of 11 mm.

Longevity. 16 years, 10 months, 11 days (Flower, 1925b, p. 933).

Diet. Spiders, grasshoppers—one of which was warningly coloured in black and yellow, stink ants (*Paltothyreus tarsatus*) were readily taken, the latter being snapped in half; the head and thorax crunched first, then the abdomen (Loveridge). Earthworms and mealworms (Boettger).

According to Rose (1929, p. 186) large prey is not killed and eaten quickly, these terrapin having an unpleasant habit of seizing a hapless frog by a hind foot, then, with forward thrusts of the claws, shredding the unfortunate creature's limb to tatters. In captivity they ate chopped meat, tadpoles, fish, crabs, snails and even weeds.

W. Cloete (in Hewitt, 1937e, p. 12) adds prickly-pear fruit to their dietary, saying: "when the fruit dropped they visited the tree and carried the fruit into the water to eat." They are partly nocturnal, being a nuisance to eel fishermen by taking their bait. After prolonged drought marsh terrapin become thin and emaciated and according to Bowker (in Hewitt) will catch small ducklings and goslings or congregate to feed upon a dead sheep should one fall into the dam where they live.

Enemies. Marsh terrapin are eaten by natives at Quissange, Angola, also by the Hereros. They are dug from their retreats by ratels and preyed upon by jackals and eagles, the latter tearing out the hinder part of the plastron of small examples according to Bradfield (in Hewitt, 1935, p. 340). Angel (1922a, p. 39) records the recovery of a small terrapin, under 40 mm. in length, from the stomach of a sea eagle (*Haliaëtus vocifer*) in the French Sudan.

Defence. When seized it defends itself effectively by squirting the contents of its cloaca at its assailant (Boettger, 1881b, p. 410). Apart from their offensive musky odour, emanating from the secreting glands by four minute pores close to the carapace opposite the fourth and eighth marginal shields, these terrapin chiefly rely on withdrawing the head and limbs within the shell, though the protection afforded is less effective than is the case with the other species of African terrapin and tortoises. The long neck necessitates the head lying sidewise, from which position the fishy eye of the reptile continues to appraise the extent of the danger.

Aestivation. When marshes and ponds commence drying out at the onset of the dry season, these terrapin dig themselves into the mud by an outward and upward movement of the hind limbs. Buxton (1937, p. 102) *thinks* that in the prolonged droughts of Turkanaland they must remain buried deeply in the sandy water-courses for years at a time. At Voi, on April 22, I encountered many in such a water-course after a heavy downpour, one of several inaugurating the arrival of the big rains. At Dodoma, during July, a hundred of these terrapin which I had been keeping in a tank, either from a sense of overcrowding—though food was abundant, or warned by some seasonal instinct—for the rains had ended six weeks before, insisted with one accord in

clambering out and piling themselves against the wire netting surrounding their inclosure. Returning them to their tank proved futile so for a week they preferred to stay exposed to the cold winds which rose at night, until I removed them indoors and packed them in crates of straw. At Mtali's, near Mkalama, on October 20, after heavy rain storms on the two preceding days, one of these terrapin was encountered at 8.15 a.m. endeavouring to dig itself into the middle of a hard though sandy road. At Mangasini, on December 12, an initial downpour of the small rains commenced at 6 p.m. and lasted till noon on the following day. This resulted in the emergence of many aestivating terrapin, numbers of which I captured in a dry water course that had held a torrent only the night before.

In Somaliland marsh terrapin aestivate from January to March and from July to September (Gadow, 1901, p. 391). In South Africa both aestivation and hibernation takes place for, should the dams and vleis dry up, they are said to leave them to bury, reëmerging after heavy thunderstorms.

Hibernation. During the South African winter, marsh terrapin usually leave the water from May to August to bury themselves in soft soil or among dead leaves beneath trees, but at Skietop, near Sidbury, with a surface temperature of from 52° to 58° in June, they remain in the dams throughout the year. (Hewitt, 1937e, p. 11.) Fleck (1894, p. 83) refers to digging them from the mud in winter in South-West Africa.

Habits. In the South African summer they like to sun at the water's edge or, on occasion, to climb the branches of overhanging trees so as to bask a couple of feet above the water, into which they retreat at the slightest alarm, their sharp eyesight enabling them to detect an intruder at some distance (Hudson, in Hewitt, 1937e, p. 12). In the tropics basking is rarely indulged in by these terrapin, though I have occasionally seen one sunning in the early morning at the edge of a water hole.

Habitat. Though quite at home and active on land, the marsh terrapin may be seen to best advantage in water where it swims and dives with confident agility, remaining below for long periods without coming to the surface to breathe. Owing to their ability to exist in swamps and small bodies of water from the coastal plain to the upland savannas at 6,000 feet, these terrapin have a distinct advantage over the so-called soft-shelled turtles whose distribution is restricted to the lakes and larger rivers.

Localities. **Anglo-Egyptian Sudan:** El Obeid; Gamilab Hills s. of Suakin; Gebel Moya near Sennar; Khoi Arbat near Port Sudan; Wad Medani; White Nile between Fashoda and Renk. **Ethiopia:** Abdallah; Ela Gura; Gonda; west of Juba River; Meddo Erelle; Oda*; Sabarguma; Sereba Ghattas. **British Somaliland:** Buran dist.; Erigavo dist. **Italian Somaliland:** Boran; Djugi; Giblene; Stagno Saha.* **Uganda:** Bussu; Kabulamuliro. **Kenya Colony:** Bulessa; Guaso Nyiro; Kapiti Plains; Kirui's in Kitosh; Lukenya Hills; Moyale; Nairobi; Sotik; Voi. **Tanganyika Territory:** Dodoma; Iringa; Kasanga; Kikamero; Kilimatinde; Lake Eyasi to Isanssu; Lake Victoria; Luguo; Mahaka; Mangasini; Masai Nyika; Mbulu; Mtali's near Mkalama; Mtita's near Dodoma; Mukwese; Ngare na Nyuki; Nzinga; Pumbo near Mondo; Ruaha River; Tabora; Tanga; Ukerewe Island. **Mozambique:** Lumbo; Quelimane; Querimba; Tete. **Nyasaland:** Livingstonia. **Northern Rhodesia:** (*fide* Pitman). **Southern Rhodesia:** Sabi River at Birchenough Bridge. **Bechuanaland Protectorate:** Gomodino Pan; Gomodimo to Koke; Kuruman; Lobatsi; Metsimaklaba River; Nkate Pan; Zweizwe River. **Transvaal:** Junction of Comati and Crocodile Rivers; Naawpoort[1] (M.C.Z.); Tuefloop on north slope Drakensburg. **Natal:** Uzumbwe Valley; Winkle Spruit. **Orange Free State:** Emmaus; Thabanchu. **Cape Province:** Besondermeid near Steinkop; Bushman's River; Cape Peninsula; Deelfontein; Gleniffer near Kei Road; Graff Reinet; near Grahamstown; Great Fish River; Kimberly; Malmsbury; Mortimer; Port St. Johns (M.C.Z.); Queenstown; Skietkop near Sidbury; Sunday's River; Warrenton. **South-West Africa:** Aroab (M.C.Z.); Aus; Chamis; Gochaganas S. of Windhuk; Hoffnung; Mookane; Namutoni; Oas; Okonjati; Possession Island,[1] Quickborn near Okahandja; Rehoboth; Rietmond; Windhuk. **Angola:** Capangombe,[1] Catumbila; Chitau; Duque de Bragança; Gauca; Humbe; Kahuihui; Kalukembe; Kalundunga; Kuvangu River S. of Vila da Ponte; Maconja; Mossamedes; Mucungu; Quilengu; Quisangue. **Belgian Congo:** Fucafuca, Yellala Falls, Congo River; Kikamero on Ruchuru plains; Manda; Mahagi Port; Monbuttu; Tembwe. **Madagascar:** (many localities).

Range. The typical race ranges outside the rainforest from the Cape to Natal, northwards to Somaliland and the Anglo-Egyptian Sudan where intermediates with the northern race occur over a wide belt from Somaliland through northern Kenya and Uganda to Senegal.

[1] Individuals with pectorals separated occur here also.

Without the continent it occurs in Madagascar, but the Sinai record (Boulenger, 1889a, p. 197) is questioned by Flower (1933, p. 752) who quotes Boulenger as saying that the old entry in the British Museum register on which it was based "may well be erroneous."

Folklore. The odour of the marsh terrapin, according to Kalahari natives, resembles that of a lion and will stampede cattle (FitzSimons, 1935b, p. 307).

Pelomedusa subrufa olivacea (Schweigger)

1814. *Emys olivacea* Schweigger, Prodromi mon. Chelon., p. 38: "In Fabulosis Nigritae" Adanson coll. = Senegal.
1835. *Pentonyx Gehafie* Rüppell, Neue Wirbelth. Fauna Abyss., Amph., p. 2, pl. i: Massaua, Eritrea.
1851. Duméril & Duméril, p. 18.
1852. A. Duméril, p. 245.
1860. A. Duméril, p. 163, pl. xiii, fig. 4.
1922a. Mertens, p. 169.
1844. *Pelomedusa gehafiæ* Gray, p. 38.
1855. Gray, p. 53.
1865. Strauch, p. 113.
1862b. Peters, p. 271.
1870. Blanford, p. 444.
1870. Gray, p. 81.
1871. Sclater, p. 325, fig. (Upper Zambezi)
1873b. Gray, p. 71.
1884a. Rochebrune, p. 22.
1935. Hewitt, p. 325.
1884a. *Pelomedusa Gasconi* Rochebrune, Faune Senegambie, Rept., p. 25, pl. i, figs. 1–2: Dagana, Senegal (restricted). No type preserved.[1]
1910. *Pelomedusa galeata* var. *disjuncta* Vaillant & Grandidier, Hist. phys. nat. pol. Madagascar, **17**, Rept., p. 56, pl. xx, fig. 3. Du Bourg de Bozas coll. = Shore of Lake Abaya, Sidamo, Ethiopia.[1]
1936e. *Pelomedusa galeata gehafie* Parker, p. 609.
1937a. *Pelomedusa subrufa gehafie* Mertens, p. 140.

In addition to the above are many citations listed under the typical form, most of them being indicated by an asterisk before the name.

Names. *Gehafie* (at Massaua); *nguru* (Kitosh); *njaba* (Ganda).

History. As the type of *olivacea* consisted of a carapace, it is pure assumption, based on the fact that *gasconi* of Senegal has the pectorals separated, that the name is employed. The race, apparently the only

[1] Data kindly supplied from Paris Museum catalogue by Mons. Angel, though the specimen could not be located at the moment.

one found in Eritrea, occurs alongside typical *subrufa* at Oda, Ethiopia and Stagno Saha, Italian Somaliland. Individuals with separated pectorals crop up again on Possession Island, South-West Africa; Capangombe, Angola; Zambezi River and Madagascar, being taken with typical *subrufa*. Though a poor race it should be recognised, perhaps, on the grounds that it is pure in Eritrea.

Description. Differs only from the typical form in having the pectoral shields widely separated on the median line of the plastron.

Localities. **Anglo-Egyptian Sudan:** Sennar. **Eritrea:** Anseba River; near Cheren; Lebka River; Massau; Sabarguma. **Ethiopia:** Lake Abaya; Oda. **Italian Somaliland:** Stagno Saha. **Kenya Colony:** Kaliokwell River; Kirui's in Kitosh **Uganda:** Mabira Forest; Mt. Elgon. **Nigeria:** Keana.

While the following are tentatively referred to this race. **French Cameroon:** Bipindi (?det.). **Togoland:** Mangu. **Gold Coast: French West Africa. Senegal:** Dagana; Rufisque (Rochebrune's other localities omitted).

Range. As indicated above, the limits of distribution of the race *olivacea* are still uncertain, it may be regarded as the drier regions of a belt extending from Senegal to Eritrea, intergrading with the typical form in the Anglo-Egyptian Sudan, Ethiopia, Somaliland, northern Kenya and Uganda.

Genus Pelusios

1825. *Sternothaerus* Bell (part), (not *Sternotherus* Gray, 1825, p. 211: type *odoratus*), p. 305.
1830. *Pelusios* Wagler, Nat. Syst. Amphib., p. 137 (type *subniger*).
1863. *Tanoa* Gray, Proc. Zool. Soc. London, p. 193 (type *sinuatus*).
1863. *Notoa* Gray, Proc. Zool. Soc. London, p. 195 (type *castaneus*, *subniger*).

Skull without supratemporal roof; quadrato-jugal widely separated from parietal; upper jaw with very indistinct median ridge on alveolar surface; between the orbits are a pair of supraorbital shields separated by a longitudinal suture and followed by a large frontal flanked by temporals; plastron large, a hinge between hyoplastra and hypoplastra permits closing of front lobe *in adults;* mesoplastral bones extending right across plastron; digits very short, the median with 3 phalanges; feet with 5 claws.

Range. Africa south of the palaearctic zone; Madagascar and islands of the Indian Ocean.

Key to the Species

1. Suture between abdominals included *more* than twice in length of anterior lobe of plastron ..... 2.
   Suture between abdominals included *less* than twice in length of anterior lobe of plastron ..... 3.
2. Crown of head vermiculated; no black vertebral line extending entire length of carapace; suture between humerals 3 to 4 times as long as that between the pectorals ..... *adansonii* (p. 483)
   Crown of head uniform except for a black Y-shaped marking uniting orbits posteriorly with nape; a black vertebral line extends entire length of carapace; suture between humerals 1½ to 2 times as long as that between the pectorals ..... *gabonensis* (p. 485)
3. Plastron entirely black, entirely yellow, or yellow with darker infuscations, the latter not forming a sharply defined angular pattern round the periphery (in some Transvaal and Malagasy terrapin the pattern of *sinuatus* is foreshadowed but not sharply defined); its anterior lobe always longer than the suture between the abdominals; posterior margin of carapace usually rounded; narrowest interorbital width equal to, or slightly longer, or slightly shorter than the suture between the supraorbitals .. *subniger*. (p. 489)
   Plastron yellow (white) broadly edged with black, the latter forming a sharply defined angular pattern round the periphery (sometimes blurred or masked in old individuals with a carapace length of 250 mm. or more); its anterior lobe longer than the suture between the abdominals (equal to or slightly shorter in old specimens); posterior margin of carapace sharply serrate except in very old terrapin; narrowest interorbital width only two-thirds the length of the suture between the supraorbitals .. *sinuatus*[1] (p. 502)

I had fully anticipated that *subniger* would be separable into a number of local forms, but though weeks were spent on this one species I have failed entirely to find any characters of colour or proportions which offer a reasonable prospect of separating alleged races. Apparently striking differences invariably turn out to be those of sex or age, while those of colour, constant in one locality, crop up here and there without obvious geographical significance.

My method was to draw up a detailed description based solely on 34 terrapin from Kaimosi in Kenya, then a similar description based on

[1] The two specimens from Port Natal, referred to *sinuatus* by Boulenger, agree with that species in having the anterior lobe shorter than the suture between the abdominals (they are old, being over 200 mm.), but Mr. Parker informs me that the female's plastron is entirely black, that of the male dark brown with the central area somewhat lighter.

12 specimens from the Seychelles, and so on. When these descriptions were compared no character of consequence could be detected. Such as appeared from the wording, were rechecked by direct comparison of the specimens and usually found to have no significance. Yet the two series cited were readily separable on their respective wholly black or wholly yellow plastrons; but such a colour difference could not be correlated with distributional areas, and so many variants of an intermediate pigmentation crop up here and there that even recognition of an average difference appeared unjustifiable.

I can only hope that enthusiasts for naming local forms will pause to accumulate big series before embarking on the description of further races for which single individuals may offer apparent justification. Comparisons, *except between individuals of the same sex and age,* lead only to confusion.

Pelusios adansonii (Schweigger)

1814. *Emys Adansonii* Schweigger, Prodromi mon. Chelon., p. 39: "Nigritis." *i.e.* Cape Verde, Senegal (*vide* Dum. & Bib., 1835).
1831. *Hydraspis Adansonii* Gray, p. 40.
1835. *Pentonyx Andansonii* (*sic*) Duméril & Bibron, p. 394.
1844. *Pelomedusa? Adansonii* Gray, p. 38.
1851. *Sternothaerus Adansonii* Duméril & Duméril, p. 19.
1855. Gray, p. 52.
1864b. Gray, p. 296, pl. xxiii.
1865. Strauch, p. 109.
1870. Gray, p. 80.
1873b. Gray, p. 70.
1884a. Rochebrune, p. 21.
1889a. Boulenger, p. 196.
1890. Büttikofer, p. 436.
1900. Flower, p. 967.
1903d. Siebenrock, p. 197.
1904. Andersson, p. 9.
1906a. Siebenrock, p. 826.
1908. Werner (1907), p. 1826.
1909. Siebenrock, p. 560.
1910. Müller, p. 623.
1912b. Werner, in Brehm, p. 470.
1917. Sternfeld, p. 414.
1919. Schmidt, p. 600.
1924a. Werner, p. 268.
1925b. Flower, p. 933.
1934a. *Pelusios adansoni* Mertens, p. 10.

Names. Adanson's Terrapin.

Illustrations. Gray (1864b, pl. xxiii) furnishes a drawing of the upper aspect of this terrapin in life.

History. The type is in the Paris Museum. Bocage (1867a, p. 217) recorded *adansonii* from Angola, later correcting his identification to *derbianus*, now a synonym of *subniger*.

Description. Head broad, snout short; a pair of supraorbital shields followed by a very large frontal, flanked by a pair of temporals; narrowest interorbital width equals the longitudinal suture between the supraorbitals; upper jaw neither hooked nor bicuspid; chin with a pair of elongate barbels; scales on anterior aspect of fore limb irregular in size; carapace moderately depressed, its height included in its length about 2.64 times, broadening posteriorly, its posterior margin rounded; vertebral shields 5, the anterior 4 keeled *throughout life*[1], broader than long in young, nearly as long as broad in adult, first and fifth subequal in length and breadth, as broad (at their broadest) as long; costals 4 pairs; marginals 22; supracaudals 2; plastron considerably smaller than the opening of the carapace; anterior lobe somewhat rounded, not or but slightly projecting beyond the carapace; posterior lobe angularly and deeply notched; intergular 1½ to 2 times as long as a gular, 2 times as long as broad, its sides wedge-shaped; humerals forming a suture 3 to 4 times as long as that of the pectorals, outer border of a humeral equal to, or shorter than, that of a pectoral; pectorals *not* excluded from bridge by abdominals; width of bridge contained 2 (young) times in the width of the plastron; suture between abdominals less than half the length of the anterior lobe of plastron.

This description is based on a Shari River juvenile in the Museum of Comparative Zoölogy, together with descriptions in the literature.

Anatomy. An abnormal Sennar shell in which the anterior costal bones are in contact, thus separating nuchal and first neural, has been described by Werner (1924a, p. 268).

Coloration. Above, head yellow vermiculated with brown; carapace yellowish to pale brown with radiating brown lines and dots. Below, labial region, plastron, and all lower parts yellowish.

Werner (1924a, p. 268), however, reports on a 160 mm. male from Tonga as being shining black both above and below except along the sutures of the plastron which are white and worn.

Measurement. Length of carapace of a Sennar specimen 185 mm., breadth 125 mm. (Werner, 1924a, p. 268).

[1] *fide* Boulenger.

Breeding. In March, at Tonga, White Nile, 7 eggs measuring 29.5 x 18 and 33 x 19 mm., were found in a ♀ by Werner (1924a, p. 268).

Longevity. 9 years, 8 months, and still alive at Giza Zoological Gardens (Flower, 1925b, p. 933).

Habitat. Rivers outside the rainforest. Siebenrock (1906a, p. 826) remarks on the fact that this species ranges to the edge of the palaearctic region and is thus the most northerly member of its genus. His suggestion that the deserts of Darfur and Kordofan have interrupted its distribution is unlikely, the answer is more probably to be found in the very little collecting which has been done in this area.

Localities. **Anglo-Egyptian Sudan:** Bahr el Gebel near Mongalla; Bahr el Ghazal; Bahr el Zeraf; Gondokoro; Khor Attar; Sennar; Tonga; White Nile south of Abu Zeit. **French Cameroon:** Guffei on Shari River; Tara on Isade River. **Senegal:** Cape Verde. **Liberia.**

Range. Senegal east to the White Nile (from Abu Zeit south to Gondokoro), Anglo-Egyptian Sudan. Reported from Liberia.

Pelusios gabonensis (A. Duméril)

1856. *Pentonyx Gabonensis* A. Duméril, Rev. Mag. Zool., **8**, p. 373: Gabon.
1860. A. Duméril, p. 164, pl. xiii, figs. 2, 2a.
1864a. Gray, p. 168.
1874. Reichenow, p. 298.
1862. *Pelomedusa gabonensis* Strauch, p. 45.
1865. Strauch, pp. 107, 113.
1864. *Pelomedusa gabonica* Peters, p. 644.
1873a. *Sternothaerus sp.* Gray, p. 393, fig.
1873b. *Sternothaerus derbianus* Gray (part), p. 69.
1876a. Peters, p. 117.
1875a. *Sternothaerus niger* Peters (not of Duméril & Bibron), p. 196.
1889a. Boulenger, p. 194, fig. 46.
1890. Büttikofer, p. 478.
1893c. Matschie, p. 208.
1897. Sjöstedt, p. 33.
1898. Werner, p. 204.
1902c. Tornier, p. 665.
1903d. Siebenrock, p. 191.
1905a. Siebenrock, p. 461.
1906. Johnston, pp. 820, 833.
1906a. Mocquard, p. 480.
1909. Siebenrock, p. 555.
1910. Müller, p. 622.
1910b. Nieden, p. 7 (text apparently transposed with that of *galeata*)

1911. Lampe, p. 148.
1925b. Flower, p. 932.
1889a. *Sternothaerus gabonensis* Boulenger, p. 197.
1897. Sjöstedt, p. 33.
1898. Werner, p. 204.
1900b. Boulenger, p. 447.
1901. Siebenrock, p. 7.
1902c. Tornier, p. 665.
1903d. Siebenrock, p. 197.
1905a. Siebenrock, p. 461.
1906a. Mocquard, p. 480.
1907. Siebenrock, p. 6.
1909. Siebenrock, p. 560.
1916. Siebenrock, p. 10, pl. i, fig. 1, pl. ii, fig. 4.
1919g. Boulenger, p. 12.
1933m. Witte, p. 67.
1901. *Sternothaerus Steindachneri* Siebenrock, Zool. Anz., **25**, p. 6: "Madagascar" Bought from a dealer.
1919. *Pelusios gabonensis* Schmidt, pp. 413, 598, fig. 1.
1934a. Mertens, p. 10.
1937c. Loveridge, p. 269.
1919. *Pelusios niger* Schmidt (not of Duméril & Bibron), pp. 598, 600.
1934a. Mertens, p. 10.
1934. Müller, p. 166.
1937a. Flower, p. 14.
1938b. Mertens, p. 33.
1924. *Sternothaerus heinrothi* Kanberg, Zool. Anz., **60**, p. 195, fig.: Cameroon.
1926. Kanberg, p. 225.

Erroneous records of *gabonensis* (Bocage, 1866a, 1866b, and Rochebrune, 1884a) will be found under *subniger*.

Names. Gaboon Terrapin.

Illustrations. Siebenrock (1916, pls. i-ii) furnishes excellent black and white figures of an adult from above and below; Duméril's (1860, pl. xiii) figures of the juvenile type do not show its distinguishing characteristics; Schmidt (1919, fig. 1) an outline drawing of a juvenile from below, nobody has figured the handsome young or middle-aged stage with its black vertebral line on a yellowish brown carapace.

History. The tangled synonymy of this species may be said to have commenced when Gray (1873a, p. 393) wrote "we have fortunately discovered a very large skull, evidently belonging to the genus *Sternothaerus*, which M. du Chaillu had used (as he did the new species of

Bush-buck which I described . . .) to stuff out the skin of a large African mammal." Later in the year Gray referred this skull to *derbianus* (which I regard as a synonym of *subniger*). Because it agreed with Duméril & Bibron's description of *niger* (1835), however, Boulenger (1889a, p. 194) identified and figured it as that species.

The pertinent portion of the description "museau allongé; machoire supérieure se recourbant en bec crochu;" is rather one of age in members of this family. It is particularly pronounced in Du Chaillu's specimen, obviously from an aged animal, as Gray states that it measured 2 1/6 inches from cheek to cheek, 2 1/2 inches from nose to condyle. The largest *gabonensis* in the Museum of Comparative Zoölogy, an alcoholic with a carapace length of 245 mm., has a head measuring 2 inches from cheek to cheek, its skull length cannot be measured.

Since Boulenger, there has been a tendency to refer all old black Cameroon terrapin to *niger*, all half-grown or young with characteristic vertebral stripe to *gabonensis* though the evolution of colouring of the carapace is clearly seen in a good series of all ages. Siebenrock even invokes the age character of colour as being the only reliable means of separating *gabonensis* from what he calls *niger, i. e.* the black throat and underparts of the young which become dirty yellow in older reptiles.

I reject *niger* as being applicable to the West African *gabonensis*, not only because Duméril & Bibron thought that it came from Madagascar, which may have been the case, but because they state that the top of the head in *niger* is marbled with brown on a fawn ground, and the jaws are horn coloured with vertical rays of a maroon tint. This is the coloring of *subniger*, not of *gabonensis*, which has a black Y-shaped marking on the occiput and the jaws uniformly coloured.

Siebenrock (1903d, p. 197) himself referred *steindachneri* to the synonymy of *gabonensis* after examining the type of the latter in the Paris Museum.

Müller (1934, p. 166) produced overwhelming proof for placing *heinrothi* in the synonymy of "*niger*," by which he meant *gabonensis* as here understood.

Description. Head broad, snout only moderately short, acuminate; a pair of supraorbital shields followed by a very large frontal, flanked by a pair of temporals; narrowest interorbital width equals or is shorter than the longitudinal suture between the supraorbitals; upper jaw angularly rounded in young, slightly notched and bicuspid in adults, hooked in very old specimens; chin with a pair of barbels which are

long in young and short in adults; scales on anterior aspect of fore limb irregular in size; carapace depressed, its height included in its length 2 34 to 3.76 times, elongate, its posterior margin rounded, not or but slightly serrate even in young; vertebral shields 5, all keeled in young, the rather nodose keels of the posterior 3 persisting except in very old individuals, all 5 broader than long in young *and* adults though occasionally the fourth and fifth may be longer than broad in adults; costals 4 pairs; marginals 22; supracaudals 2; plastron much smaller than the opening of the carapace; anterior lobe rounded or intergular slightly projecting, usually not, though occasionally slightly projecting beyond the carapace; posterior lobe more or less angularly and deeply notched; intergular normally 2, rarely 3, times as long as a gular, 1⅓ to 1½ times as long as broad, its sides straight, wedge-shaped, or pyriform; humerals forming a suture 1½ to 2 times as long as that of the pectorals outer border of a humeral longer than, rarely equal to, that of a pectoral; pectorals *not* quite excluded from bridge by abdominals; width of bridge contained 1½ (adults) to 2 (young) times in the width of the plastron; suture between abdominals included 2¼ to 3½ times in the length of the anterior lobe of plastron.

Anatomy. The skull of an old terrapin has been figured and described at length by Gray (1873a, p. 393).

Coloration. Above, head yellow brown, a broad black Y-shaped marking connects the eyes and extends backwards on the nape, another stripe between eye and tympanum is sometimes present; limbs black in young, drab buff or greyish yellow in adults; carapace yellow brown in young darkening with age through the appearance of dark radial lines on the discoidal shields till *almost* black in old individuals, a black vertebral streak, broadening anteriorly on the suture between the anterior marginals, extends to the supracaudal suture, this characteristic marking is less conspicuous in very old terrapin but can be found if sought. Below, jaws and throat *uniform* horn colour except in young when the throat is black; plastron uniform black or with the sutures between the shields narrowly edged with yellow; occasionally plastron yellowish brown, each shield so heavily overlaid with radiating black markings as to appear mostly black, carapace light yellow, each marginal blotched with black, particularly in the region of the bridge.

Measurements. Length of carapace of a ♂ from Edea, 270 mm., breadth 167 mm., height 88 mm. (Müller, 1910). Length of carapace of a ♀ from Isongo, 258 mm. (Mertens, 1938b).

Sexual dimorphism. Males, recognizable by their longer tails, ex-

hibit a slight depression in the posterior third of the plastron, which is flat in females.

Longevity. 7 years, 4 months, 20 days (Flower, 1937a, p. 14) is surpassed by one stated to be 10 years and still alive by Müller (1934, p. 166).

Diet. In captivity, water insects, ant pupae, worms, snails, fish and raw beef should be furnished *in variety, particularly for young,* at temperature of 18° to 20° C.

Parasites. Leeches were about the hind limbs of a terrapin taken from the Lepoko River (Lang, in Schmidt, 1919, p. 414).

Enemies. Eaten by the Congolese (Lang, in Schmidt, 1919, p. 414).

Habitat. Young and half grown are to be found in swampy places and smaller streams, but large examples must be sought for in the rivers of the rainforest belt, where they are frequently drowned in fish traps (Lang, in Schmidt, 1919, p. 414).

Localities. **Cabinda. Belgian Congo:** Akenge; Avakubi; Buta; Djamba; Gamangui; Ituri River west of Ruwenzori Mountains; Medje; Nepoko River; Niapu; Nyonga; Pawa; Poko; Saidi's Village on Avakubi-Irumu road; Stanleyville. **French Congo:** Gaboon. **French Equatorial Africa:** Nola. **Spanish Guinea. French Cameroon:** Ebolowa; Isongo; Jaunde; Kribi; Metet; Sakbayeme; Sanaga River near Edea; Sangmelina. **Nigeria:** Benin. **Gold Coast:** Akusi. **Liberia** (thrice reported, but without locality.)

Range. West Africa from Liberia south to Cabinda, eastwards through the Belgian Congo to the Ituri River.

Pelusios subniger (Lacépède)

1788. *La Noiratre* Lacépède, Hist. nat. Quadrup. ovip. Serpens, **1**, p. 175. pl. xiii: No locality.
1789. *Testudo subnigra* Lacépède, Hist. nat. Quadrup. ovip. Serpens, **2**, Synopsis methodica (a table in which binomials are employed).
1789. Bonnaterre, p. 30, fig. 6.
1802. Daudin, p. 197.
1798. *Testudo Nigricans* Donndorff, Zool. Beytr. Linn. Natur., **3**, p. 34: No locality.
1814. *Emys castanea* Schweigger, Prodromi mon. Chelon., p. 45: No locality.
1814. *Emys subnigra* Schweigger, p. 46.
1820. *Terrapene nigricans* Merrem, p. 28.
1825. *Kinosternon nigricans* Bell, p. 305.
1825. *Sternothaerus Leachianus* Bell, Zool. Journ., **2**, p. 306: No locality.
1831. *Sternotherus subniger* Gray, p. 38.

1844. Gray, p. 37.
1855. Gray, p. 51.
1863b. Gray, p. 195, fig.
1864b. Gray, p. 168, fig.
1870. Gray, p. 79.
1873b. Gray, p. 70.
1831. [1]*Sternotherus castaneus* Gray, p. 38.
1835. Duméril & Bibron, p. 401.
1865. Strauch, p. 108.
1866b. Peters, p. 887.
1869a. Peters, p. 12.
1878a. Peters, p. 202.
1880b. Peters, p. 509.
1880b. Vaillant, p. 797.
1881c. Boettger, p. 535.
1884a. Rochebrune, p. 19.
1891. Vaillant, p. 94.
1910. Vaillant & Grandidier, pp. 26, 58, pls. xviii-xix.
1931d. Angel, p. 550.
1835. *Sternotherus Niger* Duméril & Bibron, p. 397.
1835. *Sternotherus Nigricans* Duméril & Bibron, p. 399.
1848. Peters, p. 494, pl. xvii, fig. 6.
1862. Strauch, p. 148.
1865. Strauch, p. 108.
1867a. Steindachner, p. 6.
1877b. Peters, p. 455.
1882a. Peters, p. 8.
1884a. Rochebrune, p. 19.
1889. Boettger, p. 297.
1889a. Boulenger, p. 195.
1891. Vaillant, p. 94.
1893a. Boettger, p. 13.
1893b. Stejneger, p. 713.
1895. Rathgen, p. 200.
1896a. Bocage, p. 97.
1896. Tornier, p. 4.
1897. Tornier, p. 63.
1898. Tornier, p. 282, fig. 2.
1898a. Vaillant, p. 133.
1900b. Tornier (part), p. 582.
1903a. Siebenrock, p. 254.
1903d. Siebenrock, p. 195.
1907a. Boulenger, p. 6.

[1] The spelling *Sternothaerus* has not been separated for separate headings.

1907j. Boulenger, p. 482.
1908. Chubb, p. 220.
1908. Rembold, p. 743, figs. 2–3.
1909h. Boulenger, p. 295.
1909a. Chubb, p. 592.
1909b. Chubb, p. 34.
1910a. Andersson, p. 11.
1911b. Masi, p. 132.
1911. Sternfeld & Nieden, p. 385.
1912c. Sternfeld, p. 201.
1912b. Werner, p. 469.
1913c. Nieden, p. 59.
1916. Siebenrock, p. 6, pl. i, fig. 2, pl. ii, fig. 5.
1923g. Loveridge (part), pp. 930, 932.
1924b. Loveridge, p. 2.
1925b. Flower, p. 933.
1928. Cott, p. 952.
1931. Monard, p. 109.
1933m. Witte, p. 67.
1937b. Monard, pp. 146, 148.
1939a. Rendahl, pp. 304, 322, figs. 11–12.
1844. *Sternotherus Derbianus* Gray, Cat. Tortoises Brit. Mus., p. 37: Gambia (restricted).
1855. Gray, p. 52, pl. xxii.
1863b. Gray, p. 194.
1864a. Gray, p. 167.
1865. Strauch, p. 109.
1866a. Bocage, p. 41.
1866b. Bocage, p. 57.
1867a. Bocage, p. 218.
1870. Gray (part), p. 79.
1873b. Gray (part), p. 69.
1877c. Peters, p. 611.
1881b. Boettger, p. 409.
1884. Greeff, p. 48.
1884a. Rochebrune, p. 20.
1886a. Bocage, p. 66.
1888a. Boettger, p. 15.
1889a. Boulenger, p. 195.
1889. Hesse, p. 262.
1890. Büttikofer, pp. 436, 478.
1890a. Müller, p. 296.
1890. Strauch, p. 102.
1892c. Bocage, p. 230.
1893a. Boettger, p. 13.

1893c. Matschie, p. 208.
1895a. Bocage, p. 3.
1896a. Bocage, p. 74.
1897. Sjöstedt, p. 7.
1898. Jeude, p. 9.
1898. Werner, p. 204.
1900b. Boulenger, p. 447.
1901. Gadow, p. 391.
1901c. Tornier, p. 67.
1902c. Tornier, p. 665.
1903d. Siebenrock, p. 196.
1905. Bocage, p. 90.
1906i. Boulenger, p. 197.
1906. Johnston, pp. 820, 833.
1906a. Mocquard, p. 480.
1907. Johnson, pp. 14, 69, photo.
1908. Rembold, p. 742, fig. 1.
1909. Siebenrock, p. 559.
1911c. Boulenger, p. 162.
1911. Lampe, p. 148.
1912b. Werner, p. 470.
1919g. Boulenger, p. 12.
1919. Schmidt, pp. 598, 600.
1921a. Chabanaud, p. 461.
1921b. Chabanaud, p. 522.
1923g. Loveridge, p. 932.
1924b. Loveridge, p. 2.
1925b. Flower, p. 933.
1928. Cott, p. 952.
1930b. Witte, p. 84.
1933. Schmidt, p. 3.
1933m. Witte, p. 67.
1934a. Mertens, p. 10.
1936. Frade, p. 67, pls. vii-viii.
1937. Andersson, p. 2.
1851? *Sternotherus nigricans* ? var. Bianconi, p. 58, *nigrescens*, pl. vii. (a misprint as *Sthernotherus nigrescens* Dum. Bib. also given).
1866a. *Sternothaerus gabonensis* Bocage (*non* Duméril), p. 40.
1866b. Bocage, p. 57.
1884a. Rochebrune, p. 23.
1867a. *Sternothaerus Adansoni* Bocage (*non* Schweigger), p. 217.
1881c. *Sternothaerus subniger* Boettger, p. 535.
1910. Vaillant & Grandidier, p. 26, pls. xviii-xix.
1884a. *Sternothaerus niger* Rochebrune (*non* Duméril & Bibron), p. 19.
1884a. *Sternothaerus sinuatus* Rochebrune (*non* Smith), p. 20.

1889. Boettger, pp. 296–7.
1889a. Boulenger (part), p. 194.
1893a. Boettger, p. 13.
1895a. Bocage, p. 4.
1896. Tornier (part), p. 4.
1902d. Boulenger, p. 445.
1909b. Boulenger, p. 302.
1909h. Boulenger, p. 295.
1910. Roux, p. 100. (photographs of specimen seen).
1911. Lampe, p. 148.
1912c. Sternfeld (part), p. 200.
1937b. Monard, pp. 146, 148.
1885d. *Sternothaerus sp.* Müller, p. 716.
1909. Gendre, 1909, p. cvi.
1897f. *Sternothaerus oxyrhinus* Boulenger, Proc. Zool. Soc. London, p. 919, pl. liii: No locality. (Based on live specimen in zoo.)
1906b. *Sternothaerus nigricans castaneus* Siebenrock, p. 35, pl. v, fig. 18.
1909. Siebenrock, p. 557.
1913. Boettger, pp. 318, 352.
1915. Rawitz, p. 658, pl. xlviii, figs. 62–67.
1918. Barbour, p. 489.
1922. Kaudern, p. 449, fig. D.
1906b. *Sternothaerus nigricans nigricans* Siebenrock, pp. 36, 40, pl. v, fig. 19.
1909. Siebenrock, p. 558.
1913. Boettger, p. 319.
1915. Rawitz, p. 663.
1922. Kaudern, p. 449.
1939b. Rendahl, p. 3.
1906b. *Sternothaerus nigricans seychellensis* Siebenrock in Voeltzkow, Reise in Ostafrika in den Jahren 1903–1905, **2**, p. 38: Gloriosa Island, Seychelles.
1909. Siebenrock, p. 558.
1912c. *Pelomedusa galeata* Sternfeld (part), p. 201.
1919. *Pelusios nigricans* Schmidt, pp. 411, 460, fig. 1, pl. xi, fig. 3.
1928c. Barbour & Loveridge, p. 104.
1934. Pitman, p. 307.
1927a. *Pelusios nigricans nigricans* Hewitt, p. 375.
1933h. Loveridge, p. 209.
1936j. Loveridge, p. 223.
1937c. Loveridge, p. 269.
1937f. Loveridge, pp. 489, 492, 495.
1927a. *Pelusios nigricans castaneus* Hewitt, p. 375.
1928d. Loveridge, p. 51.
1935. Hewitt, p. 344.

1927a. *Pelusios nigricans rhodesianus* Hewitt, Rec. Albany Mus., p. 375, figs., 1a, 1c, pl. xxvi, figs. 2–3: Mpika district, N. Rhodesia.
1933h. Loveridge, p. 210.
1934. Pitman, p. 307.
1929. *Pelusios subniger* Lindholm, p. 288.
1931. *Pelusios nigricans castanoides* Hewitt, Ann. Natal Mus., **6**, p. 463, pl. xxxvi, figs. 1–2: Richard's Bay, Zululand.
1932. *Pelusios bechuanicus* FitzSimons, Ann. Transvaal Mus., **15**, p. 37: Thamalakane River at Maun, Ngamiland, Bechuanaland Protectorate.
1934a. Mertens, p. 10.
1935b. FitzSimons, p. 306, pl. xi.
1933b. *Pelusios subniger subniger* Mertens, p. 263.
1934a. Mertens, p. 10.
1933b. *Pelusios subniger castaneus* Mertens, p. 263.
1934a. Mertens, p. 10.
1933. *Pelusios sinuatus sinuatus* Schmidt (not Smith), p. 3.
1934a. *Pelusios subniger castanoides* Mertens, p. 10.
1934a. *Pelusios subniger rhodesianus* Mertens, p. 10.
1934a. *Pelusios subniger seychellensis* Mertens, p. 10.
1935. *Pelusios rhodesianus* Hewitt, p. 345.
1937b. *Pelusios derbianus* Angel, p. 1696.
1937a. Flower, pp. 14, 36.
1937f. Loveridge, pp. 489, 503.
1938e. Mertens, p. 430.
1939a. *Sternothaerus castaneus seychellensis* Rendahl, pp. 308, 322, figs. 13–14.
1939b. Rendahl, p. 3.

Erroneous records of *castaneus* (Gray, 1831, 1844) and *nigricans* (Loveridge, part, 1923g, 1928d) will be found under *sinuatus*, and *derbianus* (Gray, 1873b; Peters, 1876a) under *gabonensis*.

Names. Black Terrapin (English); *lihodu* (Tereki); *likudu* (Ragoli); *kikui* (Kami); *malfudi* (Gogo); *kajamba* (Nyakusa). In Angola *kantuva* (at Osi); *ombco* (at Bimbi); *otyiti* (at Elende); *tyitunda* (at Kuvangu). Malagasy names are not included.

Illustrations. Good photographs of living terrapin are furnished by Johnson (1907, p. 14) and Schmidt (1919, pl. xi), while most of the more recent figures cited in the synonymy illustrate some form of this variable reptile.

History. Vaillant (1891, p. 94) claims to be able to distinguish *castaneus* in West Madagascar by a fine silver line encircling the pupil, while *subniger* (or *nigricans*) of East Madagascar is said to have a uniform brown iris, the difference is supported by other characters of minor

importance. This alleged distinction appeared to me to be a sexual one, an idea which later received support from the plates supplied by Vaillant and Grandidier (1910) which show a ♂ shell as *castaneus*, a ♀ as *subniger*. The point requires checking in the field, but the more rounded shell of the female appears to have misled several workers into supposing that they were dealing with two forms. Rawitz's (1915, p. 582) statement that he noticed differences in spinal structure between Eastern and Western Malagasy specimens should also be investigated.

Mertens (1933b, p. 263) repeats the other characteristics as typifying a West Madagascar race, and they are certainly present in our solitary West Madagascar specimen but also in a Zanzibar and occasional mainland individuals. As the row of large polygonal shields anterior to the barbels may be present or absent in mainland terrapin, I do not attribute specific importance to them.

Siebenrock (1903d, p. 196) failed to find any constant characters by which *derbianus* might be separated, though he proposed retaining the name in the hope that some average difference might be found, remarking that apparently most herpetologists used the name on geographic, rather than taxonomic, grounds. Both black and yellow-brown terrapin are represented in a series from Portuguese Guinea and similar colour differences have been reported from other West African material. Our topotypic Gambia terrapin can be matched by individuals of the same age and sex from the East so I cannot see any possibility of regarding *derbianus* as separable even in a subspecific sense.

The type of *oxyrhinus* arrived at the zoo with a shipment containing *adansonii*. In describing it, Boulenger stated that *derbianus* was its closest relative but it might be distinguished on its more acuminate snout. On this account Siebenrock (1903d, p. 192) synonymized it with "*niger*", by which he meant *gabonensis* as here understood. This action was incorrect as the vermiculate head markings are those of the *subniger* group and cannot be confounded with the distinctive black Y-shaped marking on the otherwise uniform crown of *gabonensis*.

S. n. seychellensis was long ago synonymized by Boulenger (1909h, p. 295) and in detail by Nieden (1913c, p. 60). As I entertained expectations that it would prove a valid race, I induced Mr. Vesey Fitz-Gerald to send me a dozen specimens from the Seychelles. After drawing up a detailed description based solely on this material, I compared it with a similar description founded only on the thirty-four Kaimosi, Kenya Colony, terrapin. The only significant difference, apart from an average colour, was the better bicuspid development of the upper

jaw, which appears to be constant in the Seychelles, highly variable on the mainland. More recently, Rendahl (1939a, p. 308), with half-a-dozen Seychelle specimens, has revived *seychellensis* but as a race of *castaneus!* He claims that both *nigricans* and *c. seychellensis* occur on La Digue Id., and gives (p. 313) fourteen characters which allegedly separate the two. I have carefully tested these with our Seychelle material and find that Nos. 1, 3, 7 and 8 are individual variations, 11 is an age character, the rest are sexual, usually, though not invariably constant. What he has done is to separate the sexes.

In describing *P. n. rhodesianus* from Mpika district, Hewitt (1927a, p. 375) remarked that he had also a series of fairly typical *nigricans* from the same district as well as from Kenya Colony. Later, finding *rhodesianus* at Entebbe where it occurs alongside typical *subniger* (inc. *nigricans*) he thought it better to raise *rhodesianus* to specific rank. Actually it is founded on an inconstant character — the shape of the intergular — which does not remain constant as Hewitt had hoped.

P. n. castanoides of Zululand, based on a very old 325 mm. terrapin, was considered to differ in the absence of barbels. The state of development of these barbels varies considerably and though I have found no specimens in which they could not be detected, I suggest that in *castanoides* they are probably absent as an individual variation, possibly some injury to the derm in youth? FitzSimons (1935b, p. 307) found them present and absent in specimens of *Pelomedusa subrufa* in the Kalahari.

P. bechuanicus, founded on a single young 107.5 mm. terrapin, resembles *subniger* in its uniform dark brown plastron and posteriorly rounded carapace, but *sinuatus* in the strongly developed protuberances on the vertebral shields. There are, however, individuals of approximately the same size in our Kaimosi series which match this unusual development, though the majority in the series are typically *subniger* in this respect. Being so young, one would have expected the vertebral shields to be broader than long, as indeed they seem to be in the photographs; in description and diagnosis, however, they are said to be longer than broad.

Description. Head broad, snout short; a pair of supraorbital shields followed by a very large frontal, flanked by a pair of temporals (rarely subdivided), often with a wedge-shaped group of small shields inserted posteriorly between frontal and temporal, occasionally even separating them; narrowest interorbital width equal to, or slightly longer, or slightly shorter[1] than the longitudinal suture between the supraorbital

[1] Ethiopia, Tanganyika, N. Rhodesia, Transvaal, Madagascar, Mauritius, Zanzibar and Seychelles, but with exceptions.

shields; upper jaw angularly rounded, not definitely bicuspid[1] but sometimes indicated with a more or less prominent vertical groove anteriorly; chin with a pair of small barbels [2]; scales on anterior aspect of fore limb irregular in size; carapace moderately depressed, its height included in its length 2.17 to 3.30 times, elongate in males, roundish in females, its posterior margin rounded, not or but slightly serrate in young; vertebral shields 5, the middle 3[3] obtusely (rarely quite strongly with protuberances) keeled, usually [4] much broader than long in young and as long as, or longer than, broad in adults, first and fifth very variable but at their widest usually as broad as, or broader than long; costals 4, rarely 5[5], pairs; marginals 22, rarely 20; supracaudals 2; plastron smaller than the opening of the carapace in males, considerably smaller in females; anterior lobe rounded or intergular slightly projecting, not (males) or very distinctly (females) projecting beyond the carapace; posterior lobe angularly and deeply notched (with a *tendency* to be more acutely in males, more widely in females), the points upturned, recurved, or horizontal; intergular 1½ to 4 times as long as a gular, 1⅛ to 3 times as long as broad, its sides straight, wedge-shaped, converging anteriorly or pyriform; humerals forming a suture 1 to 5 times (averaging 2 for fifty terrapin) as long as that of the pectorals; outer border of a humeral normally much longer, occasionally equal to, or much shorter than that of a pectoral; pectorals excluded from bridge by abdominals; width of bridge contained 1½ to 2 times in the width of plastron, suture between abdominals shorter than (i.e. included 1¼ to 1¾ times) the length of the anterior lobe of the plastron.

The above description is based on all the *subniger* material in the Museum of Comparative Zoölogy, while variations in the literature are for the most part included as footnotes.

A deformed individual from Dakar is described in detail by Strauch (1890, p. 102).

Anatomy. Tornier (1896, p. 9) presents a diagram to illustrate the changes in the outline of a carapace which accompany growth, it should be accepted with reserve owing to his confusing *sinuatus* with *subniger*. Vaillant (1880b, p. 797) comments on the vertebral column. Frade (1936, p. 67) on the epithelial tissue, etc. Rawitz (1915, pp. 658, 663) deals with the nervous system, and Peters (1848, p. 494) with the musk gland.

[1] See Tornier (1900b, p. 582) on variability in single terrapin.

[2] Absent in type of *castanoides fide* Hewitt. See comments above.

[3] These 3 broken up into 5 in a Malagasy terrapin (Anderson, 1910a, p. 11).

[4] Exception a Chitau, Angola, juvenile and types of *bechuanicus*.

[5] Mus. Comp. Zoöl. Nos. 7869, 40031.

Coloration. Above, head yellowish or greenish gray vermiculated with brown or black, the latter sometimes predominating to produce a uniformly dark head; limbs drab or yellowish brown; tail (according to Boettger, 1888a) yellow above with a blackish median line in males; carapace in young, black, or yellowish with brown areolae which spread till carapace becomes dark brown, often leaving light brown coloured areas along the periphery, or black in adults. Below, jaws horn colour with vertical striae of brown or black; plastron horn colour or yellowish with brown or black infuscations which in Transvaal and Malagasy terrapin simulate the more definite angular markings of *sinuatus*, but usually are irregular, penetrating along the sutures between the shields, in some areas the plastron is entirely black, or black with the sutures between the shields white. In Natal (*fide* Strauch) and West Madagascar (Siebenrock and M.C.Z. specimen) the entire reptile may be stained reddish, due, it is said, to laterite soil.

Boulenger (1889a, p. 195), with only Madagascar material, writes of *nigricans* "upper surface of head without spots or vermiculations." Malagasy specimens in the Museum of Comparative Zoölogy exhibit vermiculations though these are greatly reduced in one example.

Perhaps it might be helpful to list our material on the basis of plastral coloration, allocating them into three groups though in some cases with difficulty.

Plastron wholly black, or the sutures white or horn colour. Ex. Kaimosi; Yala River; Entebbe and Ukerewe Id., Lake Victoria; Nyamkole, Lake Tanganyika; Mwaya, Lake Nyasa; Dodoma (though those from this last locality and from Ukerewe Id. appear to have lost most of the black through friction and polishing by sand).

Plastron yellow in centre, infuscated with brown on the margins. Ex. Gambia River; or the brown forming a rather definite pattern as figured by Duméril & Bibron for *castaneus* (pl. xx). Ex. Ethiopia; Transvaal; Madagascar.

Plastron wholly yellow, or almost so. Ex. Butiaba, Lake Albert; Pemba Id.; Zanzibar Id.; Seychelle Ids.

Measurements. Length of carapace of a ♂ from Faradje, 290 mm., breadth 185 mm., height 92 mm. Length of carapace of a ♀ from Faradje, 250 mm., breadth 177 mm., height 106 mm. (Schmidt, 1919, p. 412).

More than once I have been inclined to postulate a small race, as for example at Dodoma where the largest of fifty terrapin brought in by natives, measured only 175 mm. It is wiser to bear in mind, however, the relative rarity and greater difficulty in capturing the largest

terrapin. Looking over the maximum carapace lengths recorded in the literature I am inclined to think that the species attains its greatest dimensions in the region of the Great Lakes and is slightly smaller as one proceeds East and West. A trans-African series of records follow.

San Thomé, 170 mm. (Greef); Gambia, 176 mm. (M.C.Z.); Angola, 250 mm. (Monard); Belgian Congo, 290 mm. (Schmidt) and 280 mm. in s.e. Lake Albert (Sternfeld); Uganda, 241 mm. (Hewitt); Kenya Colony, 257 mm. (Loveridge); Tanganyika Territory, 235 mm. (Loveridge); Northern Rhodesia, 218 mm. (Hewitt); Zululand, 225 mm. (Hewitt); Madagascar, 220 mm. (Siebenrock); Seychelles, 168 mm. (M.C.Z.)

If Lang (in Schmidt, 1919, p. 412) is correct in saying that this species attains a length of 380 mm. (15 inches), which I am inclined to doubt, it is very little smaller than *sinuatus*, long considered the largest representative of the genus.

Sexual dimorphism. The measurements of male and female, furnished above, give a very fair idea of the difference in proportion of the sexes. The carapace tends to be parallel-sided in males, much more rounded as well as arched (to accommodate the eggs) in females, consequently the plastron appears broader posteriorly in males in its relation to the carapace, than is the case in females, it may be slightly concave in males though I am by no means certain that this is always the case as some flat-plastroned terrapin appear to be males; the notch in the posterior lobe may be more acute in males, more obtuse in females (to aid oviposition?) but this appears to be questionable, if an average difference. The tail of a male is longer, but is so short that without comparative material of the opposite sex it would not be recognised.

Boettger's (1888a, p. 15) alleged colour distinctions do not appear to be valid, though it may be anticipated that sexual difference in the colouration of the soft parts in life will be demonstrable. In this connection see the remarks on page 494 under the heading *History*, where it is suggested that the fine silver line encircling the pupil indicates a male, its absence a female; a point worth investigating.

Breeding. The only account of the oviposition of this species which I have come across, is that of Kaudern (1922, p. 449, fig. D), who surprised a female at the edge of a desiccating pond at St. Marie de Marovoay, Madagascar. He alleges that she excavated a flask-shaped hole *with her front legs and head*[1], deposited a dozen eggs in it in the

[1] Almost certainly a mistake.

course of an hour, then filled in the hole. Kaudern secured both the terrapin and her eggs. It would be interesting to know her measurements.

On March 1, at Kaimosi, Kenya Colony, a young terrapin with abdominal shields still unhealed in the umbilical region, and carapace length of 30 mm., was presumed to have hatched very recently.

Growth. In captivity, a young "*nigricans*" from Madagascar grew from 88 to 100 mm. in four years, during the same period a young "*derbianus*" from West Africa grew from 78 to 92 mm.: they shared the same aquarium (Rembold, 1908, p. 743).

Longevity. For "*derbianus*" 40 years, 8 months, 13 days (Flower, 1937a, p. 14); for "*nigricans*" 9 years, 2 months, 11 days (Flower, 1925b, p. 933).

Diet. Grass and claws of crabs (*Potamon* sp.) in faeces at Kaimosi (Loveridge). In captivity earthworms, mealworms, snails, fish, frogs, and raw meat (Rembold, 1908, p. 743).

Enemies. Frequently taken in fish traps at Faradje, Dungu River (Lang). Two terrapin, one having had a piece taken out of its side, appeared to have been bitten when young by hyenas or other carnivore (Loveridge). According to natives, African Sea Eagles (*Cuncuma v. vocifer*) were responsible for deviscerated shells found on the shores of Lake Victoria (Loveridge).

Leeches commonly occurred on these terrapin at Kaimosi.

Defence. When first alarmed, the Black Terrapin retreats within its shell, but if persistently annoyed it hisses and makes a crunching sound, presumably with its jaws, finally emerging to snap at its tormentor. If held, it scratches and discharges fluid; though the latter action may be due to fear, it may act as a deterrent to predators.

Aestivation. On February 13, at Kaimosi, the first rain for months fell between 4.30 and 5.30 p.m. The following morning a terrapin, its back caked in mud, was found wandering: the deduction that it had just emerged from aestivation appeared warranted by the mud on its carapace.

Disease. Rembold (1908, p. 742) furnishes a photograph and account of a West African "*derbianus*" which developed a sac-shaped swelling on the neck. After two years this swelling attained the size of a beechmast and was accompanied by signs of nervousness, in marked contrast to the creature's previous behaviour, though its appetite remained good. In walking, the swelling was dragged along the bottom of the aquarium by the terrapin, and considerable effort was required for the reptile to raise its head for air. It frequently

rested its head upon some floating cork-bark and evinced an increasing desire to leave the water.

Habits. Somewhat sluggish and secretive, at least the adults which may be found in shallow water at the edge of large ponds at night. Being nocturnal, they feed best in the evening, alternately gorging and fasting according to Rembold, who claims evidence that they have a well developed sense of taste. During the favourable conditions prevailing in the rainy season they are prone to wander. Lang (in Schmidt, 1919, p. 413) states that they rest upon submerged débris or aquatic vegetation with the head and shell partly out of water. Writing of "*bechuanicus*", FitzSimons (1935b, p. 306) states that they could be seen basking on exposed rocks, but slipped into the river before one could get near, being extremely shy. His type was captured with rod and line when he was fishing for barbel. I have never observed this basking habit in the equatorial belt where the waters are presumably warmer.

Habitat. Papyrus swamps, stagnant pools, ricefields, lakes and rivers outside the rainforest in coastal plain and upland savanna.

Localities. **Uganda:** Bunjako; Butiaba (Rutiala); Bussu near Jinja; Bwamba (Wawamba); Entebbe; Sesse Islands (Ussi Id.). **Kenya Colony:** Athi River near Malemboa; Kaimosi; Yala River (M.C.Z.). **Tanganyika Territory:** Bukoba; Dar es Salaam; Kaombwe's village, Nkila, Ukimba; Karagwe (Karawe); Kasanga; Kilosa; Kisaki; Lake Mkwera; Lake Nyasa; Lake Rukwa; Manda (as Wiedhafen); Mtita's village near Dodoma; Mukwese; Mwaya; Sassi, Momba; Tanga (? *sinuatus*); Ukerewe Id, Lake Victoria; Uluguru Mtns. at Nyange; Wiedhafen (see Manda). **Zanzibar:** Pemba Id.: Mbuyuni; Zanzibar.[1] **Seychelle Islands:** Diego Garcia; Gloriosa Id.; La Digue Id.; Mahé Id. **Mauritius. Madagascar** — many localities. **Mozambique:** Beira; Caia; Charre; Lorenzo Marques; Mesuril; Ziweziwe. **Nyasaland:** Shire River. **Northern Rhodesia:** Chambeshi River at Bwela Flats; Lulimalala River at Chiwali's village; Mpika district; Msofu River; Munyamadzi River; Nyamkolo. **Southern Rhodesia:** Gwamayaya River at Gwelo; Mazoe; Mashonaland (as *sinuatus*). **Bechuanaland Protectorate:** Thamalakane River at Maun. **Transvaal:** Aapies River near Pretoria. (M.C.Z.). **Zululand:** Richard's Bay. **Natal:** Durban Bay (Hewitt questions this locality on grounds collector lived in Rhodesia); **Angola:** Ambriz; Bimbi; Chimporo; Chitau; Cubal; Dondo; Duque de Bragança; Elende; Kuvangu; Loanda; Osi; Rio Cuce; Rio Quilo. **Cabinda:** Chinchoxo. **Belgian Congo:** Banana;

[1] Specimen so labelled in Mus. Comp. Zoölogy.

Dika; Dungu River at Faradje; Eala; Kando; Kikondja; Kwamouth; Lake Edward; Lukafu; Mahagi; Manda; Nyonga; Stanleyville. **Belgian Ruanda-Urundi:** Usumbura. **French Congo:** ? **Sao Thomé Id.** and Rolas. **French Cameroon:** also ? (only Sjöstedt's 1897 record of an entirely black 70 mm. terrapin) **Togoland:** Bismarckburg; Kete Kratje; Mangu. **Liberia:** Grand Cape Mtn.; Junk River. **Sierra Leone. French Guinea:** Kerouane; Labe, Fouta Djalon; Tumbo Id. **Portuguese Guinea:** Bissau; Bolama. **Gambia:** Gambia River; MacCarthy Id. **Senegal:** Cape Verde; Rufisque; (Rochebrune's records are omitted). **Cape Verde Ids.:** S. Tiago (Jago) Id. at Praia (Praja) Bay.

Range. West Africa from the Cape Verde Islands and Senegal south to Angola, east to Zululand (and possibly Natal), north to Kenya Colony, also islands of the Indian Ocean, viz. Pemba, Zanzibar, Seychelles, Madagascar and Mauritius.

Pelusios sinuatus (Smith)

1831. *Sternotherus castaneus* Gray (not Schweigger), p. 38.
1844. Gray, p. 37.
1855. Gray, p. 52.
1838. *Sternotherus sinuatus* A. Smith, Ill. Zool. S. Africa, Rept., pl. i: In rivers to the north of 25° S., South Africa.
1851. Duméril & Duméril, p. 19.
1863b. [1]Gray, p. 193, fig.
1864a. Gray, p. 166, fig.
1865. Strauch, p. 109.
1866b. Peters, p. 887.
1869a. Peters, p. 11.
1870. Gray, p. 78, fig.
1873b. Gray, p. 69.
1882a. Peters, p. 8.
1889a. Boulenger (part), p. 194.
1894a. Günther (1893), p. 618.
1894. Günther, p. 85.
1896c. Boulenger, p. 15.
1896. Tornier (part), p. 4.
1897g. Boulenger, p. 277.
1897. Tornier, p. 63.
1898. Jeude, p. 9.
1898. Johnston, p. 361.

[1] The spelling *Sternothaerus* was adopted after this date, various minor misspellings of the generic and specific name are ignored.

1898. Sclater, p. 97.
1898. Tornier, p. 282.
1899. Mocquard, p. 219.
1902b. Boulenger, p. 15.
1902b. Scherer, p. 265, fig.
1903d. Siebenrock, p. 193.
1905h. Boulenger, p. 251.
1907a. Boulenger, p. 6.
1908b. Mocquard, p. 557.
1909. Siebenrock, p. 556.
1911. Lönnberg, p. 7.
1911b. Masi, p. 132.
1912b. Boulenger, p. 329.
1912c. Sternfeld (part), p. 200.
1912b. Werner, p. 470.
1913c. Nieden, p. 55.
1915. Rawitz, p. 665, pl. xlix, figs. 68–75.
1916. Calabresi, p. 42.
1916. Siebenrock, pl. i, fig. 3; pl. ii, fig. 6.
1921d. Loveridge, p. 52.
1923b. Calabresi, p. 150.
1923g. Loveridge, p. 932.
1924b. Loveridge, p. 2.
1925b. Flower, p. 932.
1927. Calabresi, pp. 20, 37.
1930d. Witte, p. 85.
1939b. Rendahl, p. 2, figs. 1–5.

1848. *Sternotherus dentatus* Peters, Arch. Anat. Phys., p. 494: No locality.
1895i. *Sternothaerus bottegi* Boulenger, Ann. Mus. Civ. Stor. Nat. Genova (2), **15**, p. 9, pls. i-ii: Bardera, Italian Somaliland.
1897g. Boulenger, p. 277.
1900b. *Pelomedusa galeata* Tornier (part), p. 583.
1912c. Sternfeld (part), p. 201.
1923g. *Sternothaerus nigricans* Loveridge (part), p. 930.
1928d. Loveridge (part), p. 51.
1927a. *Pelusios sinuatus* Hewitt, p. 360.
1927c. Power, p. 411.
1929h. Loveridge, p. 5.
1931. Hewitt, p. 462, pl. xxxvi, fig. 3.
1933h. Loveridge, p. 208.
1934. Pitman, p. 307.
1935. Hewitt, p. 345.
1936h. Loveridge, p. 19.
1936j. Loveridge, p. 222.
1936e. Parker, p. 607.

1937a. FitzSimons, p. 261, pl. x.
1937f. Loveridge, pp. 489, 492, 495.
1939b. FitzSimons, p. 19.
1927a. *Pelusios sinuatus zuluensis* Hewitt, Rec. Albany Mus., **3**, p. 371, fig. 1d, pl. xx, figs. 1–3: Near Umsinene River, Zululand.
1934a. Mertens, p. 10.
1937b. Mertens, p. 5.
1931. *Pelusios sinuatus sinuatus* Hewitt, p. 462, pl. xxxvi, fig. 3.
1934a. Mertens, p. 10.
1933. *Pelusios sinuatus leptus* Hewitt, Occ. Papers Rhodesian Mus., p. 45, pl. ix, figs. 1–2: Isoka, Northern Rhodesia.
1934. Pitman, p. 307.

Omitted from the preceding bibliography, having been transferred to *subniger*, are records of *sinuatus* from Senegambia (Rochebrune, 1884a); Angola (Bocage, 1895a; Schmidt, 1933; Monard, 1937b); Belgian Congo (Sternfeld, 1912c); Uganda (Tornier, 1896, Boulenger, 1902d, 1909b; Nieden, 1913c); Seychelles (Boulenger, 1889a; Schmidt, 1933; Monard, 1937b); Madagascar (Boettger, 1889, 1893a). All of these regions being outside of its range.

Names. Serrated Terrapin (English); *fulwe* (Jiji); *ngongo* (Konde).

Illustrations. Smith's plate of the type is a good representation of an old individual in which many of the distinctive characteristics of the species are blurred. Boulenger's (1895i) figures of *bottegi* from above and below, give a much better idea of this distinctive terrapin. Gray (1863b) has figured the head, and Siebenrock (1916) the young for comparison with that of *nigricans*, i.e. *subniger*. Rendahl (1939b) furnishes excellent figures of the plastral pattern, particularly that of an aberrant individual (fig. 3).

History. Smith's type of *sinuatus* was recently located in the Royal Scottish Museum (No. 1859.13.1864) by FitzSimons (1937a, p. 261, pl. x), whose redescription, measurements, and figures are invaluable to all workers on the involved tangle centering round its synonymy. I have recently examined the type of *bottegi* in the Genoa Museum (C. E. 2319) and confirm Siebenrock and Calabresi in their decision to refer it to the synonymy of *sinuatus*. Cogent reasons for regarding *zuluensis* and *leptus* as synonyms were advanced by me (1936j, p. 222) some time ago, an opinion which I consider more than ever justified since seeing additional material. Rendahl (1939b) with very limited material, furnishes many measurements of variable characters in contrast with those of *subniger* (which he calls *nigricans* and *castaneus seychellensis*).

Description. Head broad, snout short; a pair of supraorbital shields followed by a very large frontal, flanked by a pair of temporals (rarely subdivided); narrowest interorbital width much less[1] (about two-thirds) than the longitudinal suture between the supraorbitals; upper jaw angularly rounded in young, sometimes notched and bicuspid in adults; chin with a pair of barbels; scales on anterior aspect of fore limb irregular in size; carapace moderately depressed, its height included in its length from 2.39 to 3.68 times, its posterior margin strongly serrate in young, more or less serrated or sinuated except in very old individuals; vertebral shields 5, the anterior 4 keeled, the median 3 more or less protuberant posteriorly, occasionally smooth in old individuals (of 221 mm. or over), as long as, or much longer than, broad in adults, much broader than long in young, first and fifth subequal in length and greatest breadth or broader than long; costals 4 pairs; marginals 22, rarely 24; supracaudals 2; plastron slightly smaller than the opening of the carapace; anterior lobe rounded, not or but slightly projecting beyond the carapace; posterior lobe angularly and deeply notched; intergular shield 1 to 3 times as long as a gular, 1¼ to 2½ times as long as broad, its sides straight or wedge-shaped; humerals forming a suture 1 to 2 times as long as that of the pectorals, outer border of a humeral shorter, rarely slightly longer, than that of a pectoral; pectorals excluded from bridge by abdominals; width of bridge contained 1½ (adults) to nearly 2 times (young) in the width of the plastron; suture between abdominals longer (adults) or shorter (young) than the length of the anterior lobe of plastron.

The above description is based solely on a score of terrapin from Kenya Colony and Tanganyika Territory, yet will be found, I think, to embrace all variations recorded in the literature or in descriptions of subspecies with the exception of those included in the footnote.

Anatomy. The skull (of *zuluensis*) has been described by Hewitt (1927a, p. 373).

Coloration. Above, head yellowish or pale olive finely speckled, striated, or vermiculated with dark brown; limbs drab or yellowish brown flecked with darker; carapace in young, olive green to gray brown turning to dark brown or black in adults. Below, plastron in *very* young terrapin, brick red edged with black, the sutures between the shields broadly edged with white; in young and half-grown, as well as in most adults, the plastron is rich yellow, its periphery edged with black in a very characteristic angular *pattern* whose sharp angles and regular outline become blurred only in very old individuals.

[1] Said to be equal to in *bottegi*, to be less or greater in *zuluensis*.

Measurements. Length of carapace of a Lake Jipe specimen[1], 380 mm. (Peters, 1882a, p. 8) exceeded only by a ♀ from Amani[2] of 383 mm. (Mertens, 1937b, p. 5). My largest, from Ruaha River, had a carapace length of 360 mm., breadth 244 mm., height 138 mm. The largest specimens are said to attain a weight of 20 lbs.

Breeding. Native fishermen at Ujiji informed me that these terrapin come ashore to oviposit in July; this is hardly confirmed by the presence there of two 51 mm. young on March 10, and two 51 mm. young at Mbanja on April 27, unless the period of development is very long.

Longevity. 8 years, 2 months, 27 days (Flower, 1925b, p. 932).

Diet. Scherer (1903b, p. 336) says that a score of young, about 50 mm. long, lived on a diet of raw fish and meat for three months, then lost appetite, refused to eat, and died. He points out that under natural conditions the insects, snails and fish upon which they feed, probably supply calcium and vitamins essential to growth. Larger terrapin of 80 mm. or more in length, throve on worms, fish and raw meat. Frogs are apparently taken, see Loveridge (M.S.S.).

Enemies. At Ujiji, some natives admitted eating these terrapin, others scornfully denied doing so.

Defence. A 173 mm. terrapin, when picked up and turned over, ejected a fine jet of fluid from its right axilla or shoulder to a distance of one foot, a second jet followed from the region of the left fore leg, than a third from the right hind leg. Usually on being disturbed, a terrapin will withdraw and enclose its head and fore limbs within the shell, in my experience never attempting to use its strong jaws for defensive purposes. Scherer (*l.c.*) states that they make low moaning noises — which he thought originated in deep breathing — when within the shell.

Habitat. Lakes and the larger rivers in the coastal belt and upland savanna, to 5,000 feet.

Localities. **Italian Somaliland:** Bardera; Bulo Burti; Dolo; Imi; Juba River; Lugh; Webi Mana. **Kenya Colony:** Archer's Post; Athi River near Malemboa; Bulessa; Galass waterhole near Lake Rudolf; Guaso Nyiro; Juja Farm; Tsavo River; Ukamba. **Tanganyika Territory:** Amani[2]; Dar es Salaam; Kaombwe's village, Nkela, Ukimba; Kasanga; Kilimanjaro; Lake Jipe; Lake Rukwa; Lake Tanganyika; Little Ruaha River; Mombas River near Sassi;

[1] Not 385 mm. as stated by Rendahl (1939b, p. 2, footnote).

[2] I would suggest that this specimen more probably came from the Sigi River below Amani and was taken up the mountain to sell by a native.

Morogoro; Muhesa; Pangani River; Ruaha River; Ruvu River; Ruvuma River; Tanga; Ujiji; Usambara. **Belgian Ruanda-Urundi:** Usumbura. **Mozambique:** Boror; Mesuril; Quelimane; near Tette. **Nyasaland:** Shire Highlands. **Northern Rhodesia:** Isoka; Munyamadzi River; Petauke. **Southern Rhodesia:** Mt. Chirinda; Sabi River at Birchenough Bridge; Salisbury district. **Bechuanaland Protectorate:** Lobatsi (seen); Notuani River mouth in Limpopo Valley. **Transvaal:** Gravelotte; Koedoeopoort near Pretoria; Letaba River near Rubber Vale; Malta near Leydsdorp; Mawobya Creeks, Great Letaba Rivers; Naboomspruit; Vaalwater, Waterberg (M.C.Z.). **Zululand:** Black Umfolosi River at 6 k.m. from Majimba Hill; Umfolosi Station; Umsinene River. **Natal:** Port Natal.[1]

Records from Senegambia, Angola, Belgian Congo, Uganda, Seychelles and Madagascar, as listed on p. 504, are rejected, having been based, so far as I have been able to ascertain, on examples of *subniger*.

Range. East Africa from Italian Somaliland south to Natal, west to Lake Tanganyika (but not Lake Victoria for Tornier (1896) and Boulenger's (1909b) records from Sesse (Ussi) Islands, and Tornier (1896) and Roux (1910) records from Bukoba were based on *subniger*). Absent also from the Seychelles and Madagascar.

[1] See footnote to key.

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